

The Transition to Electronic Documentation on a Teaching Hospital Medical Service

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ABSTRACT

The transition to electronic medical records (EMRs) often includes the transition from paper to electronic documentation, a topic less well described in the literature than other aspects of EMR adoption. As part of a broader EMR project, we have participated in the transition to electronic notes on the Medicine service of a teaching hospital affiliated with the University of Washington. During a one year period beginning in February 2005 we adopted the use of semi-structured documentation templates permitting both encoded and narrative text components for admission, progress, and procedure notes, and for some discharge summaries. Currently over 1400 notes are entered each week. Fifty eight percent are entered by residents, 20% by attending physicians, and the remainder by other trainees and staff. The period of greatest change from paper to electronic notes occurred (by design) during the late spring and summer. Leadership, application functionality, speed, note writing time requirements, data availability, training needs, and other factors influenced adoption of this important part of our EMR.

INTRODUCTION

For most health care organizations, the transition to an EMR includes adoption of results reporting systems, computerized practitioner order entry and the ability to electronically document care. A substantial literature describes the advantages and difficulties of implementing computerized practitioner order entry. Less attention has been devoted to the challenges, advantages, and costs of adopting large-scale electronic documentation^{1,2,3} to replace paper notes or dictation. We have recently changed from paper to electronic documentation on the Medicine service of an urban teaching hospital and report our experience here. We describe the problems and successes we encountered in order to help other sites planning for or beginning the implementation of electronic documentation for hospitalized patients.

BACKGROUND

Setting

The work described here was conducted at Harborview Medical Center (HMC), a 413 bed county-owned medical center. The Medicine service census averages 77 patients, including 15 on the Medical Intensive Care Service and 7 on the Cardiac Critical Care Unit service. Care is delivered by 7 teams consisting of a Medicine attending, 1 resident, 2 interns, and 0-3 medical students. An admission note and discharge summary are written for each hospitalization, and a daily progress note is written each day. Procedure notes and other specialized notes may also be written. For patients on housestaff teams (the majority), notes are usually written by interns but sometimes by residents or medical students, and then addended and cosigned by the attending physicians. These can be viewed by anyone granted access to that person's medical record, including professional fee coders, teachers, and quality assurance personnel.

The ORCA project at UW Medicine in Seattle began in 2003 and includes partial results review, an electronic Inbox, health information management applications and an inpatient pharmacy system.⁴ One of the objectives of the project was to reduce the number of locations where providers document care because the dispersion of the inpatient medical record between these separate systems increased risk that providers would miss important information that they were unaware of or had difficulty accessing. A typical inpatient at Harborview Medical Center had portions of their record in Eclipsys Sunrise Critical Care, in locally-developed web-based results review (MINDscape) and sign-out (CORES) applications, sometimes in local ("shadow") records, and in the paper medical record. A busy clinician would need to be facile finding this dispersed information, but we knew from surveys that not all physicians knew how to find notes in all these applications.

Hospital leadership identified this as an important, correctable patient safety problem and sponsored the

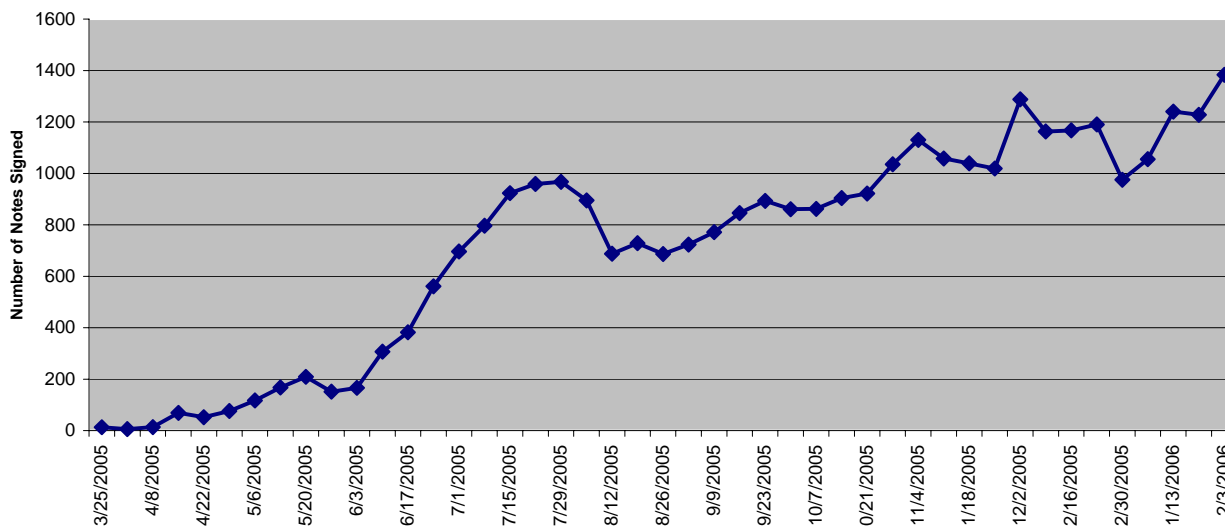


Figure 1. The number of Pownotes signed each week between March 2005 and February 2006.

project described here to convert the medical record for Medicine service inpatients to a single electronic documentation system viewable by all authorized practitioners. Pownote, a semi-structured documentation tool offered by our primary EMR vendor (Cerner) was selected.

Chronology

In January, 2005, prior to initiating the project, admission notes were written on paper, discharge summaries were dictated and daily progress notes were either written on progress note paper or on paper templates generated by a web-based application.⁵ Planning for the electronic documentation initiative began with a visit in January, 2005 by a Harborview delegation to University of Missouri at Columbia where Pownote had been successfully used for several years. A small UW team of physicians and technical staff designed note templates with close collaboration by Medicine service and ICU leaders, housestaff, attendings, and billing staff. Beginning November, 2004, selected specialists used templates to write bronchoscopy procedure notes, then a small number of Medical staff leaders used the application in February and March, 2005, for attending notes and established technical and workflow feasibility. In June, 2005, the Medical Intensive Care Service began documenting with Pownote for all new admissions, and within 2 weeks all notes for those patients were electronic. In late June (a week prior to the arrival of new housestaff) all ward teams began using Pownote for newly admitted patients on the

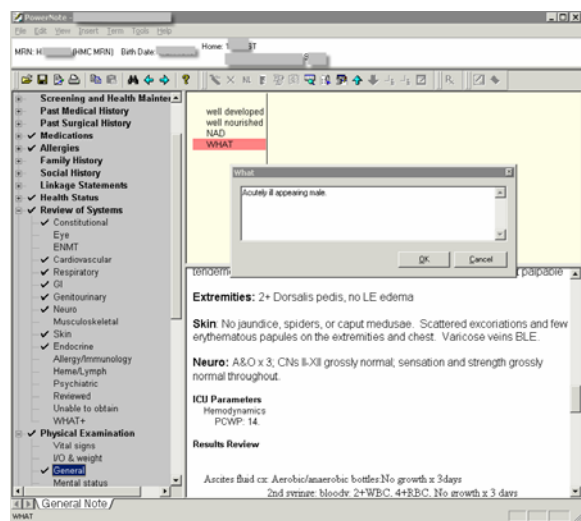
Medicine services, and at the beginning of the academic year as new housestaff arrived each patient had an electronic note available. In July, 2005 the Cardiology Service adopted Pownotes for all their inpatients. Consult services (Pulmonary, Gastroenterology, Cardiology, Endocrinology, Nephrology, Pain Service) adopted electronic notes over the fall of 2005. In November the inpatient Rehabilitation Service began using Pownotes, followed by the inpatient psychiatry service at UW Medical Center. In these services, policy required that all notes be entered electronically except during downtimes.

Description of functionality

After logging in to the patient's electronic record, the patient can be selected from a list. The Pownote application is launched from the Clinical Notes tab. The Pownote application uses a structured documentation format in which the mouse is used to click on paragraph headings to include in the notes, such as "History of Present Illness." Encoded content can be selected from displayed choices; many can be designated as positive or negative by clicking on the right or left side of the displayed term, respectively. For example, in Review of Systems clicking to the left of the word Dyspnea shows dyspnea present, while clicking to the right shows dyspnea denied. Narrative text can be entered in an editor by selecting a WHAT box. Stored text (such as signature block) and collections of positive or negative findings can be stored and replayed using macros. Notes can be started *de novo*, or a prior note

can be copied forward, edited, and saved as a new note, which is typically done to write daily progress notes based on the prior day's note. User-defined precompleted notes can also be customized, saved, and re-used to customize notes to each user's preferences. Notes by residents are forwarded to attendings who can create an addendum including attesting to their presence and involvement in the patient's care as appropriate, and then cosign the note. These addenda are written using a simple text editor which is automatically invoked when a user chooses to modify a signed document.

Figure 2. Example of Pownote. As described in text, note is entered by selecting from coded choices, entering narrative text in a 'WHAT' box, or importing from patient results.



METHODS

The number of Pownotes written each week was determined using a query written in a proprietary query language (Cerner Command Language, CCL). A count of the role of the authors for Pownotes written at HMC was also determined using a CCL query. No patient- or provider-identified information was included in these extracts. Observations on implementation issues, costs, and benefits were determined by the authors who were integrally involved in development, implementation, and support of clinicians entering electronic notes on the HMC Medicine service.

RESULTS

Figure 1 shows the number of notes directly entered each week between March 2005 and February 2006.

Table 1 shows the number of notes written by different user groups during a one week sample for the week ending February 3, 2006. This shows only notes entered using Pownote—the predominant method of note entry on the HMC Medicine service—but does not include addenda to Pownotes, including those written by attending physicians.

Number and specificity of templates. Diagnosis-specific note templates provided by our vendor were judged inadequate for our inpatients with multiple simultaneous acute and chronic conditions, so we designed templates corresponding to paper note headings for admission and progress notes in typical use (Figure 2). We chose to create a General Note template containing many paragraph headings used for floor, critical care patients, and clinic patients rather than create separate templates for each setting. In addition to structured 'checkbox' data entry favored by the vendor templates, our templates provided numerous fields to allow entry of narrative text. This was in response to user requests to improve the ability to convey complex, clinically rich information perceived as critical for subsequent clinical care. A paragraph heading which wasn't used (e.g. ICU Parameters) would not display in the completed notes. For the Medicine service, 5 note templates were used: General Note (used for Admission and Progress Notes), Discharge Summary (also used for Transfer and Interim Summaries), and 3 procedure notes (Central Line, Thoracentesis, Paracentesis). A notification was placed on the patient's paper chart indicating that certain notes were viewable in Powerchart.

Table 1. Number of Pownotes entered by users of various positions during a one week period ending February 3, 2006.

Position	Count (percent)
Residents	813 (58)
Attendings	276 (20)
Medical students	151 (11)
Midlevel practitioners	94 (7)
Fellows	50 (4)
Support staff	7 (1)
Trainers	3 (0)
TOTAL	1394 (100)

Printing. When fewer than 10 physicians were writing electronic notes, we required that each note be printed and placed in the paper chart. In June when conversion of the entire service began, we no longer required printing.

Backup. A subset of recent notes and results was copied to an encrypted file viewable on several workstations placed on each ward. When a designated USB drive was placed in that workstation, this file could be viewed and printed if needed, such as during unscheduled downtime. In practice, unscheduled downtimes were uncommon during the first year so these workstations were rarely used. For scheduled downtime, the last several days of notes were printed and placed in paper charts.

Application functionality and bugs. Numerous application problems which included application crashes, prolonged delays during note saving, and others hampered acceptance. Fixes in content usually required weeks; software issues referred to the vendor required placement in a queue and often required months to fix when a solution was possible.

Ability to insert vital signs data and view images. Powernote permits selection of laboratory results from a grid for inclusion in the note. In paper templates generated by CORES (the system used prior to Powernote), vital signs, intake and output totals, and invasive monitoring data were automatically included in the paper note. Housestaff were accustomed to reviewing these data in the note and no longer needed to write it in themselves. When our Powernote initiative was launched, we anticipated that these same data would be selectable for inclusion in Powernotes as lab results are; technical delays have not permitted this to occur, resulting in reduced acceptance of the application. Also, it is not possible to view radiology images using Powerchart. Some services (e.g. surgical critical care) require both these features before moving to Powernote documentation.

Core EMR performance. Powerchart performance is regarded as slow, requiring up to 15 seconds to open a chart during busy times. Performance is not scheduled to improve until 15 months after the Medicine Service conversion began.

Copying and pasting. As others have noted,^{6,7} the ability to copy from prior notes permits inappropriate as well as appropriate copying and pasting of note contents. A taskgroup charged by the Chief of Medicine drafted guidelines for copying and pasting which was vetted within Harborview and approved both there and elsewhere in UW Medicine.

Training and support. Residents, attending physicians and medical students rotate between services each month. Monthly training sessions taught by medical center staff in a nearby building are held the first day of each rotation for one hour; training staff teach for 6 hours in the classroom each

month. For one hour each week several IT team members answer questions and give impromptu training on the wards, and receive feedback on desired enhancements and problems in return. We offer food (ice cream, cookies) to encourage participation. After-hours support is by phone and regarded as insufficient by housestaff.

Review by professional fee billing staff. Each day professional fee billing staff review electronic versions of notes using a report in spreadsheet form. Since both housestaff and attending notes are immediately viewable, they can assign the appropriate code and manually enter it into the professional fee billing system. Though Powernote includes software to assign evaluation and management codes, we have not used this because narrative text information is not counted. Coding is done manually.

COSTS AND BENEFITS

Additional time requirement. Housestaff have accepted Powernotes but regard electronic note writing to be slower than using paper templates derived from CORES. However, writing procedure notes using Powernote is faster and popular.

Clinical utility of notes. Attending staff have noted more rapid communication of clinical data because notes are forwarded by housestaff immediately on completion. At the same time, some attendings have reported that critical details are more difficult to find than in handwritten notes because it is more difficult to emphasize them in the regimented format, and because less relevant information is easier to carry forward.

Data dispersion. For the Medicine service, vital signs, notes by nursing, social work and other non-physician practitioners continue to be entered in Eclipsys. Radiology images are viewed using MINDscape. Notes by services other than Medicine are written on paper or in Eclipsys and will continue to be until Powernote speed is enhanced and vital signs and radiology images are available through Powerchart. As a result during the transition, data dispersion has increased. However, we're planning to convert all HMC services to electronic documentation through ORCA within the next 12 months.

Improved note availability and legibility. Electronic notes are immediately visible by all involved in that patient's care including nursing and consultants. Legibility is improved. Attending physicians are able to review and write notes

remotely after completing attending rounds, verifying but not repeating detail included in the resident note to which their addendum is attached. Professional fee coders appreciate the predictable structure and note legibility. Preliminary data suggest that charge lag for professional fees has not changed.

Transmission of notes to outside practitioners. Notes carbon copied to the primary provider can be electronically transmitted to that person's Inbox, or automatically printed and mailed to non-UW practitioners which may improve care continuity.

DISCUSSION

At eight months, the conversion of Medical Service documentation to electronic form is largely complete, and is regarded variously as acceptable or successful. Most regard the success of the conversion to be a reflection of the commitment of key, visible, respected clinical leadership to this initiative. We regard the extensive involvement of physicians and other clinicians in tailoring templates to clinician-users needs to be very important and key to the rapid pace of this project. The openness and patience of housestaff to a new documentation approach was essential to the progress we have made.

At the same time, the transition requires training time and entry time by housestaff. We have not yet united the medical record into a 'one-stop shop', a potential burden on efficiency. Clinical teaching staff continue to express the need that notes continue to be clinically relevant, readable, and concise.

Further research

We currently have no data on additional time requirement for electronic documentation. Note quality, or even what a 'good' note is, has not been defined or measured. It is very likely too early to detect improvement in patient safety by reducing the location of the medical record, since only two of 12 services has converted to electronic documentation using this tool.

CONCLUSIONS

Though the period of greatest change from paper to electronic documentation on the inpatient Medicine service is over, important steps remain—including application improvements, greater data availability within the note-writing application (for example, vital signs)—before electronic documentation will be adopted by other services in HMC. The goal of reducing dispersion of the medical record between

multiple locations has been improved on one of 12 services, but has not been achieved within HMC as a whole.

ACKNOWLEDGEMENTS

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